BMR Journal of Australian Geology & Geophysics, 7, 113-118. 

# A REVIEW OF THE CORELLA FORMATION, MOUNT ISA INLIER, QUEENSLAND

D. H. Blake

As mapped by previous workers, the Corella Formation is the most extensively exposed formation in the eastern succession of the Proterozoic Mount Isa Inlier. Outcrops consist partly or predominantly of thin-bedded calcareous metasediments, many of which are scapolitic, and occur in three zones. The Corella rocks in the westernmost zone, Zone A, form a well-defined stratigraphic unit overlying felsic volcanics dated at about 1780 m.y., and it is suggested that they be asssigned to a new formation. Those in the central zone, Zone B, probably belong to at least two separate units, one more than 1740 m.y. old and possibly older than 1870 m.y., and one about 1600 m.y. old, 70 m.y. younger than the Mount Isa Group. Zone B contains the type section for the Corella Formation, but this defines neither the top nor the base of the formation, its location is uncertain, and stratigraphic relations of rock types within it are largely unknown. The suggestion is made that, for the present, the Corella Formation in Zone B be downgraded to Corella beds. The Corella rocks in Zone C, to the southeast, can be assigned to two units—the Doherty Formation, which contains rhyolite dated at about 1720 m.y., and the less-metamorphosed and probably younger Staveley Formation.

## Introduction

The status of the Corella Formation, a unit of mainly calcareous metasediments, especially calc-silicate rocks, has recently become a contentious issue in interpretations of the Proterozoic geological history of the Mount Isa Inlier. The problem is whether the formation represents a single unit with a restricted time range, as favoured by Derrick and co-workers (e.g., Derrick & Wilson, 1981), or two or more stratigraphic units of widely different ages, as suggested by Blake (1980, 1981).

According to Carter & others (1961) and most later workers (e.g., Plumb & Derrick, 1975; Derrick & others, 1977a; Plumb & others, 1980, 1981), the Mount Isa Inlier (Orogen) consists of a northerly trending belt of mainly igneous basement rocks flanked on either side by stratigraphically equivalent younger cover rocks, which are generally known as the western and eastern successions (see Blake, 1980, for an alternative view). The Corella Formation is confined to the eastern succession.

The Corella Formation was defined by Carter & others (1961), following a broad reconnaissance survey of the Mount Isa region in the 1950s by geologists from the Bureau of Mineral Resources (BMR) and the Geological Survey of Queensland (GSQ). The original definition was retained, with a few minor modifications, in a recent revision of the Corella Formation by Derrick & others (1977a). In this revision, one of the results of the more detailed survey of the Mount Isa region carried out by BMR and GSQ geologists from 1969 to 1980, the main change was the replacement of part of the Corella Formation west and southwest of Cloncurry by a new formation, the Overhang Jaspilite.

As mapped by Carter & others (1961) and Derrick and co-workers, the Corella Formation is the most extensive formation exposed in the Mount Isa Inlier. It includes almost all the calcareous rocks and calc-silicate rocks found in the eastern succession in the southern part of the Inlier, and has an outcrop area of nearly 5000 km$^2$. Outcrops of the formation occur in three broad north-south-trending zones: a western zone, here termed Zone A, which lies mainly west of the highly deformed Wonga Belt; a central zone, Zone B, which includes most of the Wonga Belt, as well as a large area to the east; and an eastern zone, Zone C, to the east of the Duck Creek Anticline (Fig. 1). The type section designated by Carter & others (1961) for the formation is in Zone B, and two reference sections selected by Derrick & others (1977a) are in Zone A.

The Corella Formation is currently correlated by Derrick and co-workers with the Quilalar Formation of the western succession (Plumb & others, 1980; Derrick & others, 1980), a unit which is conformable or disconformable on the Haslingden Group and separated from the overlying Mount Isa Group by a regional unconformity. It has also been correlated with the Mount Isa Group (Plumb & Derrick, 1975; Derrick & others, 1977b), and with the Myally Beds (Carter & others, 1961), now the Myally Subgroup of the Haslingden Group.

## Corella Formation in Zone A

In Zone A the Corella Formation is exposed in a series of mainly tight, upright, major synclines and half-synclines (one limb removed by faulting parallel to the axial plane), where it consists predominantly of grey calcareous and now scapolitic sedimentary rocks that have been regionally metamorphosed to greenschist and amphibolite grades; the metamorphism shows a general increase in grade eastward towards the Wonga Belt. The Corella Formation in this zone is readily divisible into three conformable unnamed members: a lower mainly pelitic member, a middle mainly arenaceous member, and an upper mainly pelitic member (Derrick & others, 1977a; Wilson & others, 1977). In PROSPECTOR*, but not in MARY KATHLEEN to the south, minor metabasalt is present at the top of the upper member.

The maximum thickness of the Corella Formation in Zone A is about 1260 m, and stratigraphic sections in which thicknesses of more than 1000 m are present are believed by Derrick & others (1977a) to be nearly complete; i.e., in these sections there has been little post-depositional erosion of the Corella Formation. The three unnamed members of the formation show considerable variations in thickness, and this is attributed to lateral facies changes (e.g., Wilson & others, 1977).

* Names of 1:100 000 Geological Sheet areas are given in capitals.

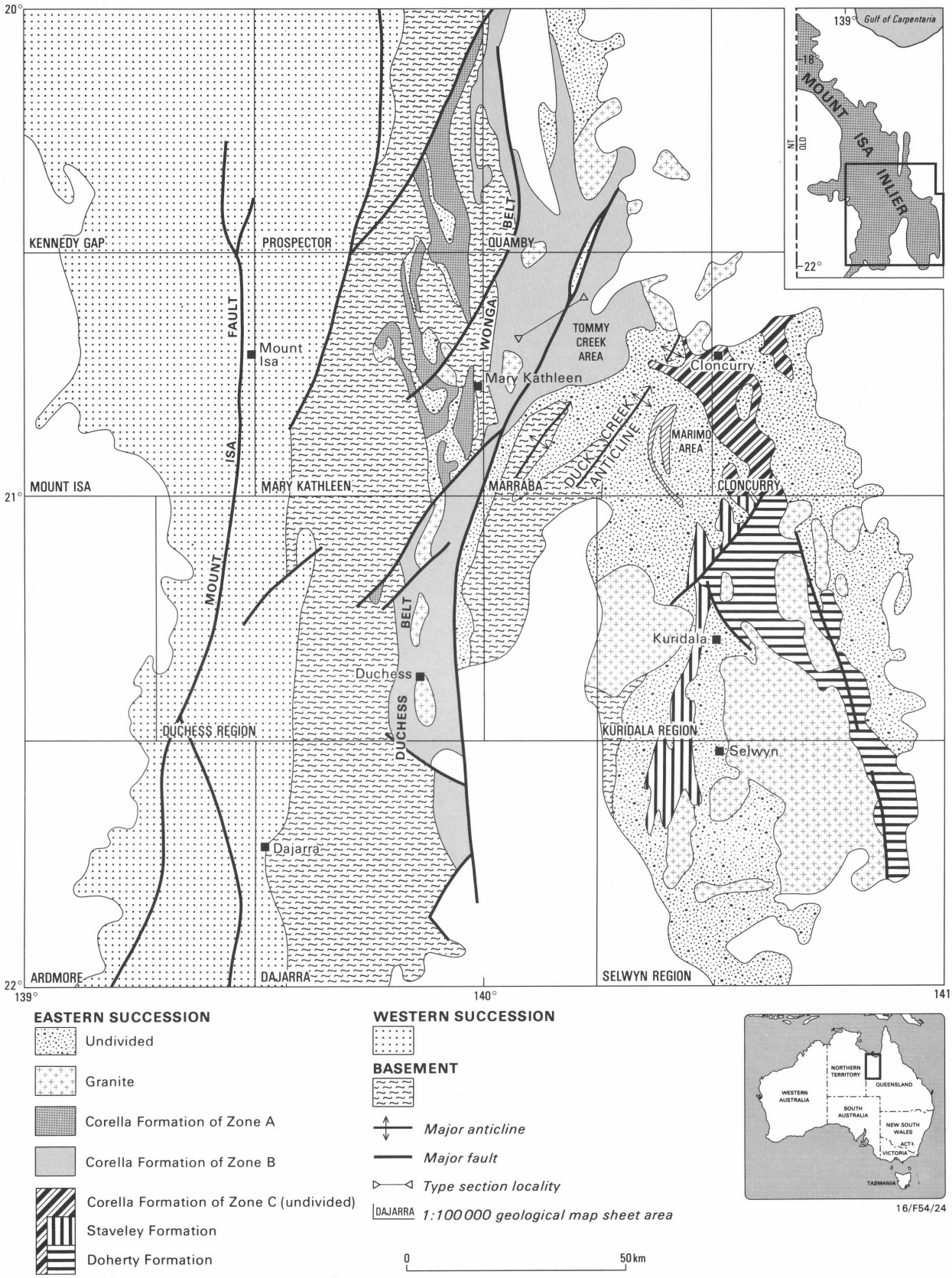


**Figure 1. Location of different Corella Formation sequences recognised in the southern part of the Mount Isa Inlier.**

The Corella Formation of Zone A corresponds to the 'young' Corella Formation of Blake (1980), and may be a correlative of the Quilalar Formation to the west, as suggested by Derrick & others (1980). It overlies the Ballara Quartzite conformably and is overlain disconformably and locally with angular unconformity by the Deighton Quartzite. As it has a distinctive lithology and mappable upper and lower contacts, it is a well-defined stratigraphic unit.

The Zone A Corella Formation postdates felsic volcanics of the Argylla Formation, dated at about 1780 m.y. (Page, 1978, in prep.), which underlie the Ballara Quartzite and are generally considered to be part of the basement underlying the eastern and western successions (e.g., Plumb & others, 1980). It is probably older than the Mount Isa Group, dated at about 1670 m.y. (Page, 1981), as this group is disconformable on the Surprise Creek Formation, a unit that overlies the Quilalar Formation and is considered by Derrick & others (1980) to be a correlative of the Deighton Quartzite. Several igneous bodies (Hardway Granite, dolerite sills) intrude the Corella Formation in Zone A, but the ages of these have yet to be determined.

The general concordance (parallelism of bedding) and absence of metamorphic unconformities in the sequence Argylla Formation/Ballara Quartzite/Corella Formation/Deighton Quartzite in Zone A, and similarly in the sequence Haslingden Group/Quilalar Formation/Surprise Creek Formation/Mount Isa Group of the western succession to the west, in the southern part of the Mount Isa Inlier, indicate that the regional metamorphism and tight folding affecting all these units probably took place some time *after* the deposition of the Mount Isa Group. There is no evidence to suggest that a major tectonic event involving greenschist to amphibolite grade regional metamorphism occurred in this part of the Mount Isa Inlier during the period from 1780 m.y. ago, the age of the Argylla Formation, or even from about 1870 m.y. ago, the age of felsic volcanics (Leichhardt Metamorphics/Volcanics) underlying the Argylla Formation, to about 1670 m.y. ago, when the Mount Isa Group was deposited (Blake, 1981).

## Corella Formation in Zone B

The Corella Formation, as mapped in Zone B, forms a belt up to 35 km wide, consisting mainly of banded and brecciated calc-silicate rocks, quartzite and other meta-arenites, felsic and mafic metavolcanics, mica schist, marble, and carbonaceous metasiltstone. It differs from that in Zone A in the following respects:

- It is much thicker: a *minimum* thickness of 2000 m near Mary Kathleen (Derrick & Wilson, 1981) and a possible maximum thickness of more than 4000 m (Derrick, 1980) contrasts with a *maximum* thickness of about 1260 m for the Corella Formation in Zone A.
- It contains abundant felsic and mafic volcanics: these are widespread in DUCHESS REGION (Bultitude & others, in prep.) and DAJARRA (Blake & others, 1981c), and also in MARRABA (Derrick, 1980), where, in my view, much of the unit mapped as intrusive Tommy Creek Microgranite is metamorphosed felsic volcanics that are interlayered with calcareous metasediments (see also Derrick, 1980, p. 14) and many of the amphibolite and metadolerite bodies within the Corella Formation are extrusive rather than intrusive.
- The metasediments are generally more calcareous (Derrick & Wilson, 1981).
- The formation is not readily divisible into lower and upper pelitic members and a middle arenaceous member (Derrick, 1980), and comprises a complex of lithologic units rather than stratigraphic members—as is evident on MARRABA (Derrick, 1980) and QUAMBY (BMR, 1980) geological maps. Relations between these lithologic units are often uncertain.
- It is generally more deformed and metamorphosed.
- Its stratigraphic relations are not clearly defined, and the presence in Zone B of correlatives of the Ballara and Deighton Quartzites, which stratigraphically bound the Corella Formation in Zone A, is open to doubt. Within the Wonga and Duchess Belts in the west of Zone B some discontinuous bands and lenses of quartzite occur at or close to concordant contacts between the Corella Formation and felsic gneisses to the west, and those in the Wonga Belt have been assigned to the Ballara Quartzite by Derrick (1980) and Derrick & Wilson (1981); however, this correlation is questioned by Blake (1980, 1981). According to Derrick & Wilson (1981), facing evidence indicates that the Corella rocks overlie the felsic gneisses, but such evidence may be of doubtful reliability where the rocks are intensely deformed and metamorphosed. To the east, in the southern part of MARRABA (Derrick, 1980), the Corella Formation is reported to overlie, either conformably or disconformably, the Overhang Jaspilite, a formation consisting largely of thin-bedded calcareous metasediments, like the Corella Formation, but contacts between these two units in Zone B are invariably marked by breccia, possibly of tectonic origin. In the north, in QUAMBY, Corella rocks are reported to be overlain, probably conformably, by the Knapdale Quartzite, a possible correlative of the Deighton Quartzite (Derrick & others, 1977c; Wilson & others, 1979), but this formation is not exposed to the south.

Clearly, the Corella Formation in Zone B is not such a well-defined stratigraphic unit as the Corella Formation of Zone A, and the possibility that two or more sequences of significantly different ages are represented should not be discounted. This possibility is supported by U-Pb zircon age data obtained by Page (1978, 1979, 1981, in prep.) on spatially associated intrusive and extrusive igneous rocks: in Zone B the Corella Formation is intruded by several granitic bodies, including the Burstall Granite, northeast of Mary Kathleen, dated at 1720–1740 m.y., and the Tommy Creek Microgranite further east, which is dated at about 1600 m.y.; in the Tommy Creek area the formation also includes felsic metavolcanics dated at about 1600 m.y. Hence some Corella rocks in Zone B are probably about 1600 m.y. old, 70 m.y. younger than the Mount Isa Group, and some are probably more than 1740 m.y. old. The older Corella rocks appear to have been deformed and metamorphosed both before and after being intruded by the Burstall Granite and similar granites to the south (e.g. Derrick, 1980; Plumb & others, 1980; Bultitude & others, in prep.), as these granites and probably related pegmatite veins cutting folded Corella rocks are themselves deformed and recrystallised. The later tectonism may be equivalent to that affecting the Corella Formation and underlying Argylla and Leichhardt rocks in Zone A, but the earlier tectonism possibly predates the 1870 m.y. old, Leichhardt rocks, as suggested by Blake (1980, 1981).

In addition to containing relatively old and young rocks, the Zone B Corella Formation may also include rocks of intermediate age, such as correlatives of the Zone A Corella Formation. Distinguishing the potentially different sequences of lithologically similar rocks may be a problem, because of the generally intense deformation and metamorphism in Zone B, and will require additional work in the area. One possible contact between different sequences of Corella rocks is exposed 23 km east of Mary Kathleen, about one hundred metres north of the Barkly Highway. Here, a zone a few metres wide, consisting of angular fragments of calc-silicate rocks, separates tightly folded, thin-bedded calc-silicate rocks to the south from a northerly dipping sequence of interbanded biotite schist, bedded calc-silicate rocks, felsic and mafic metavolcanics, and black slate to the north. The tightly folded sequence is intruded by Burstall-type granite and may be part of the pre-1740 m.y. old Corella Formation (the 'old' Corella Formation of Blake, 1980), whereas the northern sequence includes the felsic volcanics dated at about 1600 m.y. by Page (in prep.). The fragmentary zone separating the two sequences may represent either a major unconformity or a faulted contact.

### Type section of the Corella Formation

The type section is the specifically designated sequence of rocks that constitutes the standard for the definition and recognition of a stratigraphic unit; in order to be recognised away from its type section, a unit must have essentially the same lithology and relative stratigraphic position as in its type section (Hedberg, 1976). Hence, the type section is critical in the definition of a stratigraphic unit.

The type section for the Corella Formation selected by Carter & others (1961) 'cuts obliquely across strike, and extends from a point half a mile (0.8 km) east of the Federal copper mine, on the Cloncurry-Mount Isa road about 23 miles (37 km) from Cloncurry, thence westerly along the road 2–3 miles (about 5 km) to the old Mary Kathleen mine road, which is then followed for about ten miles (16 km) to an outcrop of Wonga Granite'. The Cloncurry-Mount Isa road is the former main road, in use before the sealed Barkly Highway was completed in the mid-1960s, but the old Mary Kathleen mine road cannot be identified with certainty (Wilson & Hutton, 1980). Hence, the location of the western and central parts of the type section is not clear. As noted by Carter & others (1961) and Derrick & others (1977a), the type section contains many faults, intricate folding, and probable repetitions and absences of strata. Derrick & others (1977a) considered the top of the formation was not defined in the type section and the lower part was poorly represented. However, they proposed that the type section of Carter & others be retained except for about 3 km at its western end, which, they stated, consists of recrystallised felsic volcanics assigned to the Argylla Formation. The type section area contains good exposures of laminated calc-silicate rocks and calc-silicate breccia, and also a variety of other rock types, including mica schist, phyllite, metabasalt, quartzite, metagreywacke, black slate, albitite, and intrusive granite, pegmatite, and metadolerite. However, because of a general lack of sedimentary facing evidence, together with structural complexities, a stratigraphic sequence has yet to be established in this area.

The obvious conclusion is that the type section of the Corella Formation has too many deficiencies to be considered a suitable standard for the definition and recognition of a formation: it defines neither the top nor the base of the unit, its exact location is uncertain, and stratigraphic relations of rock types in it are largely unknown.

## The Corella Formation in Zone C

This zone includes the outcrops of Corella-type rocks in the Marimo area of southeast MARRABA (Derrick, 1980), in CLONCURRY to the east (Glikson & Derrick, 1970), and in KURIDALA REGION (Donchak & others, in prep.) and SELWYN REGION (Blake & others, in prep.) to the south (Fig. 1). Two sequences of rocks previously mapped as Corella Formation can be distinguished here, but neither can be correlated with reasonable assurance with the Corella Formation of the type section area in Zone B.

The more extensive of the two sequences crops out in the eastern part of the zone, and in the KURIDALA REGION and SELWYN REGION is now named the Doherty Formation (Blake & others, 1981a, 1981b). It is probably several thousands of metres thick, and consists predominantly of thin-banded calc-silicate rocks (metasediments) and calc-silicate breccia, but it includes small amounts of schist, carbonaceous metasiltstone, metabasalt, and also metarhyolite which is thought to be extrusive and has been dated by the U-Pb zircon method at 1720 ± 7 m.y. (Page, in prep.). These rocks are moderately to tightly folded and have been regionally metamorphosed to amphibolite grade. The Doherty Formation is in contact with other Proterozoic stratigraphic units, none of which are obvious correlatives of any units exposed in Zones A and B. However, it is generally bounded by faults and breccia zones, and its stratigraphic position relative to adjacent units is uncertain. At present, the Doherty Formation is thought to overlie, perhaps conformably, the Soldiers Cap Group, which includes some interbedded calc-silicate rocks, and it may be a correlative of the Kuridala Formation.

The other sequence previously mapped as Corella Formation in Zone C crops out west of the Doherty Formation, and, in the KURIDALA REGION and SELWYN REGION is now assigned to the Staveley Formation, a unit defined by Carter & others (1961) and revised by Blake & others (1981a, 1981b). It consists predominantly of bedded and brecciated sandy and silty sediments, which are commonly calcareous, and includes some limestone and calc-silicate rocks. In general, these rocks have been regionally metamorphosed to greenschist grade only. Delicate sedimentary structures are preserved in many places, and halite casts are present at a few localities. The formation may have a maximum thickness of 2000 m or more, but this is uncertain because of faulting, tight folding, and a lack of marker beds.

The Staveley Formation overlies the Overhang Jaspilite and Answer Slate to the west, either conformably or disconformably, and is overlain, apparently conformably, by the Agate Downs Siltstone, Marimo Slate (with which it also appears to interfinger), and sandstone mapped as possible Roxmere Quartzite (Blake & others, 1981a). Contacts with the Overhang Jaspilite are

generally marked by iron and manganese-rich breccia, which may be part of a regolith representing a significant erosional unconformity. North of Kuridala the Staveley Formation is faulted against higher grade metamorphic rocks of the Doherty Formation, and, therefore, is probably the younger unit, although the possibility that the two formations are lateral equivalents cannot be completely discounted. Southwest of Selwyn the Staveley Formation appears to be unconformable on the Kuridala Formation (Blake & others, in prep.). In the Marimo area, in southeast MARRABA, the Marimo Slate sequence includes some calcareous bands, assigned to the Corella Formation (Derrick, 1980), which are probably correlatives of the Staveley Formation: these bands are similar in lithology and relative stratigraphic position to calcareous bands in the Staveley Formation to the south.

In general, the Staveley Formation is more sandy, less calcareous, and less metamorphosed than the Doherty Formation, and its stratigraphic relations are better defined. Both formations are intruded by granites (undated) of the Williams Batholith and by metadolerite and dolerite.

The age of the Staveley Formation is uncertain. If it is disconformable on the Overhang Jaspilite and younger than the Doherty Formation, as is thought likely, it is probably younger than 1720 m.y., and could be similar in age to the Corella sequence dated at about 1600 m.y. in the Tommy Creek area of Zone B—the two sequences occupy similar synclinoria situated on opposite sides of the Duck Creek Anticline.

## Conclusions

All the sequences mapped as Corella Formation by Carter & others (1961) and Derrick and co-workers contain calcareous sediments that have been regionally metamorphosed to greenschist and amphibolite grades, and many of these metamorphic rocks are scapolitic. This lithologic similarity appears to have been the main reason for assigning the sequences in Zones A, B, and C to a single formation, the implication being that, in the eastern succession, carbonate deposition took place during a single period of relatively short duration. In contrast, calcareous and especially dolomitic sediments occur at more than one stratigraphic level in the western succession: they are common, for example, in the upper part of the Myally Subgroup (Wilson & others, 1977) and in the overlying Quilalar Formation (Derrick & others, 1980; Derrick & Wilson, 1981), and also in the much younger Mount Isa and McNamara Groups (Hill & others, 1975; Hutton & others, 1981). The stratigraphy of the Mount Isa Inlier, in fact, is characterised by the repetition, at different stratigraphic levels, of similar rock types, such as quartz sandstones, mafic volcanics, felsic volcanics, and calcareous sediments (e.g., Blake, 1980; Plumb & others, 1980, 1981). Consequently, lithology by itself is not a reliable correlation factor.

The other main criteria for correlating geographically separated sequences—stratigraphic relations and similarity in age—do not support the view that the Corella Formation is a single stratigraphic unit. The Corella sequences in the different zones are not in contact with the same units, and U-Pb zircon data indicate that the sequences include rocks ranging in age from pre-1740 m.y. to about 1600 m.y.

The Corella Formation in Zone A is a well-defined stratigraphic unit. Unlike that in the other zones, it comprises three readily identifiable members, it is clearly conformable on the Ballara Quartzite, which overlies the 1780 m.y. old Argylla Formation, and it is overlain by the Deighton Quartzite disconformably and, locally, with angular unconformity. The Zone A Corella sequence may be correlated with the Quilalar Formation of the western succession, and is probably older than the 1670 m.y. old Mount Isa Group. It cannot be correlated with any certainty with the sequence exposed in the type section area of the Corella Formation in Zone B. I suggest, therefore, that this sequence be defined as a new formation, using one of the reference sections proposed by Derrick & others (1977a) as its type section.

The Corella Formation of Zone B is not a well-defined stratigraphic unit. It probably contains two sequences of quite different ages, one older than 1740 m.y. and perhaps older than 1870 m.y. and one about 1600 m.y. old. It may also include other sequences of intermediate age. The type section of the Corella Formation, which is situated in this zone, is not a suitable standard for defining and recognising a stratigraphic unit. Because of these factors, I suggest that the Corella Formation in Zone B be down-graded in status to *Corella beds* until the different sequences within it can be defined as separate formations or until the unit, at least in its type section area, can be shown to be a legitimate formation according to the International Stratigraphic Guide (Hedberg, 1976).

In Zone C the Corella Formation, as mapped previously, comprises two lithologically and stratigraphically distinct sequences. In the KURIDALA REGION and SELWYN REGION these are now assigned to the Doherty Formation, which is probably about 1720 m.y. old, and the Staveley Formation, which is probably somewhat younger, perhaps similar in age to the 1600 m.y. old Corella sequence in the Tommy Creek area of Zone B. I suggest that the Corella rocks of Zone C in MARRABA and CLONCURRY should also be assigned to one or other of these two new formations or, if this is not possible at present, they should be mapped temporarily as Corella beds.

## References

BLAKE, D. H., 1980—The early geological history of the Proterozoic Mount Isa Inlier, northwestern Queensland: an alternative interpretation. *BMR Journal of Australian Geology & Geophysics*, 5, 243-56.

BLAKE, D. H., 1982—The early geological history of the Proterozoic Mount Isa Inlier, northwestern Queensland: an alternative interpretation: Reply to discussion. *BMR Journal of Australian Geology & Geophysics*, 6(3), 272-4.

BLAKE, D. H., BULTITUDE, R. J., & DONCHAK, P. J. T., 1981a—Definitions of newly named and revised Precambrian stratigraphic and intrusive rock units in the Duchess and Urandangi 1:250 000 Sheet areas, Mount Isa Inlier, northwestern Queensland. *Bureau of Mineral Resources, Australia, Report* 233, *BMR Microform* MF164.

BLAKE, D. H., BULTITUDE, R. J., & DONCHAK, P. J. T., 1981b—Summary of new and revised stratigraphic nomenclature in the Precambrian of the Duchess and Urandangi 1:250 000 Sheet areas, northwestern Queensland. *Queensland Government Mining Journal*, 82, 580-9.

BLAKE, D. H., BULTITUDE, R. J., & DONCHAK, P. J. T., 1981c—Dajarra, Queensland. *Bureau of Mineral Resources, Australia, 1:100 000 Geological Map Commentary.*

BLAKE, D. H., JAQUES, A. L., & DONCHAK, P. J. T., in prep. —Selwyn region Queensland. *Bureau of Mineral Resources, Australia, 1:100 000 Geological Map Commentary.*

BULTITUDE, R. J., BLAKE, D. H., DONCHAK, P. J. T., & MOCK, C. M., in prep.—Duchess region, Queensland. *Bureau of Mineral Resources, Australia, 1:100 000 Geological Map Commentary.*

BMR, 1980—Quamby, Queensland, 1:100 000 Geological Series, Sheet 6957. *Bureau of Mineral Resources, Australia.*

CARTER, E. K., BROOKS, J. H., & WALKER, K. R., 1961—The Precambrian mineral belt of north-western Queensland. *Bureau of Mineral Resources, Australia, Bulletin* 51.

DERRICK, G. M., 1980—Marraba, Queensland. *Bureau of Mineral Resources, Australia, 1:100 000 Geological Map Commentary.*

DERRICK, G. M., & WILSON, I. H., 1981—The early geological history of the Proterozoic Mount Isa Inlier, northwestern Queensland: an alternative interpretation: Discussion. *BMR Journal of Australian Geology & Geophysics,* 6(3), 267-71.

DERRICK, G. M., WILSON, I. H., & HILL, R. M., 1977a—Revision of stratigraphic nomenclature in the Precambrian of northwestern Queensland. VI: Mary Kathleen Group. *Queensland Government Mining Journal,* 78, 15-23.

DERRICK, G. M., WILSON, I. H., HILL, R. M., GLIKSON, A. Y., & MITCHELL, J. E., 1977b—Geology of the Mary Kathleen 1:100 000 Sheet area, northwest Queensland. *Bureau of Mineral Resources, Australia, Bulletin* 193.

DERRICK, G. M., WILSON, I. H., & HILL, R. M., 1977c—Revision of stratigraphic nomenclature in the Precambrian of northwestern Queensland, VII: Mount Albert Group. *Queensland Government Mining Journal,* 78, 113-6.

DERRICK, G. M., WILSON, I. H., & SWEET, I. P., 1980—The Quilalar and Surprise Creek Formations—new Proterozoic units from the Mount Isa Inlier: their regional sedimentology and application to regional correlation. *BMR Journal of Australian Geology & Geophysics,* 5, 215-23.

DONCHAK, P. J. T., BLAKE, D. H., JAQUES, A. L., & NOON, T. A., in prep.—Kuridala region, Queensland. *Bureau of Mineral Resources, Australia, 1:100 000 Geological Map Commentary.*

GLIKSON, A. Y., & DERRICK, G. M., 1970—The Proterozoic metamorphic rocks of the Cloncurry 1:100 000 Sheet area (Soldiers Cap Belt), northwestern Queensland. *Bureau of Mineral Resources, Australia, Record* 1970/24 (unpublished).

HEDBERG, H. D. (editor), 1976—International stratigraphic guide. *Wiley, New York.*

HILL, R. M., WILSON, I. H., & DERRICK, G. M., 1975—Geology of the Mount Isa 1:100 000 Sheet area, northwest Queensland. *Bureau of Mineral Resources, Australia, Record* 1975/175 (unpublished).

HUTTON, L. J., CAVANEY, R. J., & SWEET, I. P., 1981—New and revised stratigraphic units, Lawn Hill Platform, northwest Queensland. *Queensland Government Mining Journal,* 82, 423-34.

PAGE, R. W., 1978—Response of U-Pb zircon and Rb-Sr total-rock and mineral systems to low-grade regional metamorphism in Proterozoic igneous rocks, Mount Isa, Australia. *Journal of the Geological Society of Australia,* 25, 141-64.

PAGE, R. W., 1979—Mount Isa project. *In* Geological Branch Summary of Activities 1978. *Bureau of Mineral Resources, Australia, Report* 212, *BMR Microform* MF81.

PAGE, R. W., 1981—Depositional ages of the stratiform base metal deposits at Mount Isa and McArthur River, Australia, based on U-Pb zircon dating of concordant tuff horizons. *Economic Geology,* 76(3), 648-58.

PAGE, R. W., in prep.—Early to Middle Proterozoic evolution in the Mount Isa Inlier, Australia, as revealed by U-Pb zircon systems in superposed felsic volcanic sequences.

PLUMB, K. A., & DERRICK, G. M., 1975—Geology of the Proterozoic rocks of the Kimberley to Mount Isa region. *In* KNIGHT, C. L. (editor), Economic geology of Australia and Papua New Guinea. Volume 1—Metals. *Australasian Institute of Mining and Metallurgy Monograph* 5, 217-52.

PLUMB, K. A., DERRICK, G. M., & WILSON, I. H., 1980—Precambrian geology of the McArthur River-Mount Isa region, northern Australia. *In* HENDERSON, R. A., & STEPHENSON, P. J. (editors), The geology and geophysics of northeastern Australia. *Geological Society of Australia, Queensland Division, Brisbane,* 71-88.

PLUMB, K. A., DERRICK, G. M., NEEDHAM, R. S., & SHAW, R. D., 1981—The Proterozoic of northern Australia. *In* HUNTER, D. R. (editor), Precambrian of the southern hemisphere. *Developments in Precambrian Geology,* 2, *Elsevier, Amsterdam,* 205-307.

WILSON, I. H., & HUTTON, L. J., 1980—Geological field work in Mount Isa district—August and September, 1980. *Geological Survey of Queensland, Record* 1980/34 (unpublished).

WILSON, I. H., DERRICK, G. M., HILL, R. M., DUFF, B. A., NOON, T. A., & ELLIS, D. J., 1977—Geology of the Prospector 1:100 000 Sheet area (6857), Queensland. *Bureau of Mineral Resources, Australia, Record* 1977/4 (unpublished).

WILSON, I. H., NOON, T. A., HILL, R. M., & DUFF, B. A., 1979—Geology of the Quamby 1:100 000 Sheet area (6957), Queensland. *Bureau of Mineral Resources, Australia, Record* 1979/56 (unpublished).